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GEOLOGY.—*Geology of a vein occurrence of rutile-ilmenite in a new locality.*[1] THOMAS L. WATSON, University of Virginia.

INTRODUCTION

In each of the several known world areas of commercial rutile, the mineral occurs as a primary constituent of some type of igneous rock, formed either as a product of crystallization from a molten magma or as the result of pneumatolysis. As a primary mineral formed under igneous conditions, rutile is a high temperature product, but probably not in all cases necessarily accompanied by high pressure. Accurate measurements by the Bureau of Standards, Washington, D. C., on carefully prepared specimens of rutile separated from the igneous rocks, syenite and nelsonite, of Nelson County, Virginia, gave 1690° C. (syenite) and 1700° C. (nelsonite).[2]

The occurrence of primary coarse rutile in veins and pegmatites is well known but not common. The two occurrences are closely related genetically, and in each, rutile has developed as a primary mineral under conditions of high temperature.

Of the vein occurrences of primary rutile, the mineralogic types, rutile-bearing apatite veins, with or without scapolite, and rutile-bearing quartz veins, with or without ilmenite, seem well established. Others are known, especially some metalliferous veins, in which rutile occurs as a minor constituent.

Representatives of the apatite vein type in Norway and Sweden have been described by Vogt[3] and are regarded by him to be of pneumatolytic character. In this type rutile is associated with the titanium minerals, ilmenite and titanite. Important rutile-bearing apatite bodies with or without ilmenite and known as the rutile variety of the igneous rock nelsonite occur in Nelson County, Virginia. These have been

[1] Received October 19, 1922.

[2] WATSON, THOMAS L. and TABER, S. Va. Geol. Survey Bull. 111-A: 154. 1913.

[3] VOGT, J. H. L. *Genesis of Ore Deposits.* Trans. Amer. Inst. Min. Engrs., 646. 1901.

described by Watson and Taber,[4] who regard them as igneous dikes and not true veins.

The rutile-bearing quartz vein type, with or without ilmenite, is represented in the Piedmont Plateau province of the southern Appalachians, especially Virginia, where several occurrences are known. The known occurrences of this type of vein are characterized by the absence of all minerals except quartz and rutile and, in some instances, ilmenite. The purpose of this paper is to describe one of the more important occurrences of this type.

The older gneisses and schists of the Piedmont province of the southeastern Atlantic States have been freely injected in places by granite pegmatites and quartz veins, which both conform with and cut across the structure of the rocks. All gradations between typical granite pegmatites, with or without rarer minerals, and quartz veins, with or without other minerals, exist and can be traced. Black tourmaline is a frequent mineral in many of the quartz veins of the Virginia Piedmont province, but so far as the writer is aware it does not occur in the rutile-bearing type of quartz vein.

The pegmatite occurrence of rutile is likewise represented in the old gneiss-schist complex of the Virginia Piedmont Plateau province. One of the most important of these from the standpoint of probable commercial rutile is an area[5] in Goochland and Hanover counties, Virginia, near but within the eastern border of the Piedmont province. Here granite-gneisses are injected by granite pegmatites which conform as a rule, with the gneiss structure. Some of these carry rutile as a primary constituent in grains and masses of many pounds in weight. The rutile is frequently intergrown with ilmenite, but there is a singular absence of other minerals save the common rock-making silicates of granite pegmatites. Unlike the rutile-ilmenite intergrowths of the Franklin County, Virginia, quartz vein described below there is general absence of crystal form in the titanium minerals occurring in the pegmatites of Goochland and Hanover counties.

Recently rutile has been noted by the writer in one of the extensively worked pegmatites of the Amelia County, Virginia, area, so well known to mineralogists for the large number of rarer minerals found in them. Part of a prismatic crystal of rutile weighing 1 pound

[4] WATSON, THOMAS L. and TABER, S. Va. Geol. Survey Bull. III-A: 100–155. 1913.

[5] WATSON, THOMAS L. and TABER, S. Va. Geol. Survey Bull. III-A: 248–261. 1913. HESS, FRANK L. Mining World 33: 305–307. 1910.

was obtained by the writer during a recent visit to the area. No published record mentions rutile among the rarer minerals found in the pegmatites of this area.

Finally the pegmatite body described by Hess[6] at Baringer Hill, Llano County, Texas, carries rutile and is of especial interest on account of the association of minerals of the rare earth metals.

GEOLOGY OF THE VEIN AREA

The rutile-bearing quartz vein described in this paper is located in Franklin County, Virginia, 15 miles in a direct line southeast of Roanoke City and about 1 mile west of Teels Mill, near the entrance of Indian Creek into Roanoke River. It is crossed by the Roanoke-Franklin highway and is less than a mile southwest of Roanoke River. (See Roanoke, Virginia, topographic sheet, U. S. Geol. Survey.)

The vein occurs about 8 miles east of the main Blue Ridge in the pre-Cambrian schists of the western part of the Piedmont Plateau province. The surface of the area is one of moderately strong relief with an average elevation above sea level of between 900 and 1,000 feet. The rocks are deeply weathered, yet outcrops of fairly fresh and hard rock are common. Where crossed by the highway the vein has an elevation of 1,000 feet above sea level.

The vein is inclosed in dark gray, mica schists, composed chiefly of biotite, but variations in mineral composition are frequent. The structure (schistosity) of the schists strikes N. 50–60° E. and dips 80–85° S.E. Veins and thin stringers of white granular quartz similar to that of the rutile-bearing vein, but characterized by the absence of all minerals save quartz, are fairly numerous. They usually lie in the foliation planes of the schists and hence are comformable with the structure. Likewise occasional thinly schistose granite pegmatites not exceeding 3 feet in width, also occur in the schists conformable with the structure, but no indication of rutile was noted in them.

The schist weathers to a red clay soil through which are scattered leached yellow folia of biotite. Also loose fragments of white quartz derived from the quartz veins by weathering are thickly strewn over the surface in many places.

The vein outcrops on the north side of the road, on the Maxey place, as a low reef-like form traced for a distance of nearly 100 feet. Loose fragments (float) of the vein rock, however, can be traced

[6] HESS, FRANK L. U. S. Geol. Survey Bull. 340: 287–294. 1908.

beyond the outcrop for some distance to the northeast. Apparently the vein does not outcrop on the southwest side of the road, but quartz-rutile-ilmenite fragments are scattered over the surface for a short distance. Like the numerous quartz veins within the area the rutile-bearing vein apparently conforms with the structure of the inclosing schists, since it has a strike of N. 60° E. and dips 80–85° S.E. It will not exceed 50 feet in width.

The vein was prospected for rutile about 10 years ago with the reported result that considerable rutile was obtained, but nothing could be learned of its disposition. Development work was confined to the outcrop portion of the vein. It comprised a cut 60 feet long by an average of 5 feet deep opened in the vein. The cut extended from the road in a N. 60° E. direction (strike of the vein), and southwestward under the road for an additional distance of 30 feet. On the north edge of the road a shaft was sunk in the vein from the bottom of the cut for a depth of 30 feet. Most of the vein, so far as the development work discloses, is entirely barren, neither rutile nor ilmenite having been observed by the writer in its outcrop portion. The rutile obtained was derived chiefly from the shaft and to a less extent from that part of the open cut near the shaft.

The surface in the vicinity of the shaft, especially along the road side, is reported to have been thickly covered with fragments of quartz containing rutile crystals and of loose crystals of rutile free from quartz, but most of them have been taken away.

Small crystals of rutile and fragments of vein quartz with rutile were found on the J. S. Oyler place about 1 mile northwest of the rutile-bearing quartz vein on the Maxey place. Although no outcrop of a vein was noted in this locality, the surface indications undoubtedly suggest the occurrence of a rutile-bearing quartz vein of similar character to the one on the Maxey place.

MINERALOGY OF THE VEIN

The mineralogy of the vein is very simple. It is composed almost throughout of white vitreous quartz with, locally, rutile and ilmenite, which are the only other minerals observed. It is entirely massive and without evidence of mashing.

Quartz.—In thin sections under the microscope the quartz forms a mosaic of interlocking angular grains that are colorless and transparent, remarkably free from inclusions, and of exceptional purity. The

grains frequently show shadow extinction, but less often is there evidence of peripheral shattering or granulation.

Rutile.—The rutile is developed in elongated prismatic crystals of dark red-brown color up to $6^1/_2$ cm. ($2^9/_{16}$ inches) long and 1 cm. ($^9/_{16}$ inch) broad. The prism faces are usually vertically striated and in case of the larger ones are deeply furrowed. Terminal crystal faces are absent and twin crystals are rare. The rutile is locally distributed through the quartz matrix in clusters of prismatic crystals, and as scattered single crystals. Thin films or wedges of quartz sometimes part crystals for more than half their length. When the rutile crystals are broken from the matrix, the quartz surfaces are smooth, almost polished, and preserve completely the angles and striations of the rutile prism faces. The crystals are usually straight but curved ones sometimes occur.

In thin sections under the microscope the rutile is brownish yellow and without noticeable pleochroism. Cleavage is usually well developed but twinning is rare. Much of the rutile appears to be fresh, but some of it shows clouded surfaces indicating slight alteration. The rutile is partly intergrown with and partly altered to ilmenite, relationships which are discussed below. A chemical analysis of the rutile is given in column I of Table I.

Ilmenite.—This mineral exhibits no unusual microscopic characters. Occasional inclusions of quartz occur, but those of rutile are more frequent. Like the rutile it is usually fresh, but much of it shows partial alteration, chiefly about the boarders and along cleavage and fracture directions, probably to leucoxene. The most interesting feature of the ilmenite is its intergowth relation to rutile.

Microscopic study of thin sections shows that the two minerals rarely occur as separate individuals, but are usually intergrown with the characteristic prismatic habit of rutile. This relationship has frequently been observed by the writer in formless grains and masses of rutile, but rarely to such a degree in perfectly formed prismatic crustals of rutile. It is well brought out chemically in the analysis given in column II of Table I. The analysis was made on what was assumed, after careful examination to be a single individual of ilmenite, but on recasting the analysis in the usual way, it is clear that the specimen was composed of a mechanical mixture of rutile and ilmenite, with the former predominating.

Rutile-ilmenite relationships.—Microscopic study of thin sections

shows the rutile-ilmenite relations referred to above to be (1) definite intergrowths of the two minerals, and (2) alteration of rutile to ilmenite, all the important stages in the process being traced under the microscope. That the individual crystals in most instances are composed of a mixture of the two minerals is also evident megascopically, but without the microscope it is not possible to distinguish between ilmenite that is primary and that which is secondary.

Much of the ilmenite is undoubtedly secondary, the early stages in the alteration of the rutile being particularly well-marked under the microscope. These are shown principally in irregular dark gray nearly black patches and areas of variable size, composed of exceedingly fine granules of ilmenite, not connected apparently with lines of fracture or parting; and in similar irregular areas, directly connected with both fracture and parting (cleavage) planes, which gradually fade into the unaltered rutile. In each case the boundaries are gradational and lack sharpness of definition. Some ilmenite is developed in the rutile in reasonably closely spaced parallel line-like bodies having sharp definition and strongly suggestive of primary origin, but they may possibly be secondary.

A part of the ilmenite on the other hand is definitely primary, the two minerals, rutile and ilmenite, being molded against each other in sharp and distinct contacts, and each is inclosed in the other as in simultaneous crystallization. In some thin sections, the boundaries are more angular and irregular and are marked by reentrances and tiny stringers of ilmenite penetrating the rutile. In such cases these relations may cast doubt on the primary character of the ilmenite, but the irregular angular boundaries of the rutile-ilmenite are no more emphasized than are the boundaries between rutile and quartz in the same thin sections.

Some of the ilmenite has undergone partial alteration about the borders and along fractures to a fine-granular grayish substance probably leucoxene. Such peripheral alteration of the ilmenite is shown whether in contact with rutile or not. Distributed through this alteration product at times are very minute black granules which may represent residual ilmenite, although their identity is uncertain. The alteration in such cases makes it uncertain as to whether the ilmenite was originally primary or secondary, but the writer is rather inclined to regard much of it as having been originally primary and subsequently altered.

Bearing of rutile-ilmenite intergrowths on composition of rutile.—This subject is discussed elsewhere by the writer[7] and is only briefly touched on here. The intergrowth relations of the two titanium minerals described above have their analogy in the titaniferous magnetites which have been shown by others to be a mechanical mixture of ilmenite in the host magnetite.

All modern analyses of rutile show the presence of ferrous oxide in variable amounts. The writer suggests that probably the source of this constituent is from ilmenite mechanically mixed with rutile and not from a supposed isomorphous mixture of ferroustitanate ($Fe(TiO_3)$) and titanyl titanate ($(TiO)(TiO_3)$), as has been advanced by some.[8] This explanation certainly seems applicable to the rutile of the Franklin County, Virginia, vein. Many supposed cases of isomorphism among sulphide minerals have been shown by modern critical study to represent mechanical mixtures.[9] The writer is convinced that this relationship holds among opaque oxides.

CHEMICAL COMPOSITION OF THE RUTILE-ILMENITE

Chemical analyses of the rutile and rutile-ilmenite from the Franklin County, Virginia, rutile-bearing quartz vein are given in Table I below.

TABLE I.—ANALYSES OF RUTILE AND RUTILE-ILMENITE, FRANKLIN COUNTY, VIRGINIA

	I	II
TiO_2	97.30	80.85
SiO_2	.12	.06
Cr_2O_3	.05	.03
V_2O_3	.26	.17
FeO	2.21	18.81
MnO	.09	.14
H_2O	.10	.04
	100.13	100.10

I. Rutile, Franklin County, Virginia. William M. Thornton, Jr., analyst.

II. Rutile-ilmenite, Franklin County, Virginia. Dorothy Getz, analyst.

The possible effect of the presence of Cr_2O_3 and V_2O_3 in rutile, as shown in all recent accurate analyses, has been discussed by the

[7] WATSON, THOMAS L. *Rutile-ilmenite intergrowths.* Amer. Mineralogist. 1922. (In press.)

[8] SCHALLER, W. T. U. S. Geol. Survey Bull. 509: 9–39. 1912, and references.

[9] WHERRY, E. T. This JOURNAL 10: 488. 1920. FOSHAG, W. F. Am. J. Sci. 1921.

writer in an earlier number of this Journal.[10] Recasting the two analyses above by allotting FeO to TiO_2 to form ilmenite ($FeO.TiO_2$) the mineral composition in terms of rutile and ilmenite is:

	I	II
Rutile	94.80	59.92
Ilmenite	4.71	39.67
Rest	.62	.44
	100.13	100.03

The analysis in column II clearly shows a mixture of rutile and ilmenite, in which rutile is in largest amount. Although a thin section of this particular specimen was not examined, it is not improbable that some of the ilmenite may have been secondary.

BOTANY.—*The genus* Culcita.[1] WILLIAM R. MAXON, National Museum.

The tribe Dicksonieae, one of the three groups of Cyatheaceae or tree ferns, is usually regarded as consisting of three genera: *Dicksonia*, *Cibotium*, and *Balantium*, all represented in both hemispheres. The distinctions between *Dicksonia* and *Cibotium* are fairly pronounced, and both names are currently applied in their proper sense. *Balantium*, though showing indusium characters similar to those of *Dicksonia*, is habitually very different from either, and its recognition as a valid genus is general. The name *Balantium*, however, is technically a synonym of *Dicksonia* and must be supplanted by *Culcita*, as shown below. The distinctive characters of the genera of Dicksonieae were stated briefly by the writer a few years ago in a popular article on the tree ferns of North America[2] and the name *Culcita* was there employed in the present sense, without, however, a statement of the reasons for substituting it for *Balantium*.

The genus *Dicksonia* was described by L'Héritier in 1788 [3] with two species: *D. arborescens*, from St. Helena, and *D. culcita*, from San Miguel, one of the Azores, both being proposed as new. The former is an arborescent plant and, except for its temporary reference to *Balantium* by Hooker in 1838, has been consistently retained as the

[10] WATSON, THOMAS L. This JOURNAL **2**: 431–434. 1912.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received October 9, 1922.

[2] Report Smiths. Inst. **1911**: 463–491. *pl. 1–15*. 1912.

[3] Sert. Angl. 30. 1788.

typical member of a group of species now numbering more than a score, under the generic name *Dicksonia*. The second species, *D. culcita*, became later the type of *Culcita* Presl.

The genus *Cibotium* of Kaulfuss, though sometimes credited to his *Enumeratio Filicum* (1824), was actually published four years earlier in a little known pharmaceutical journal.[4] The type and only species mentioned at the original place of publication is *C. chamissoi*, of the Hawaiian Islands. There are about ten recognized species, most if not all of them treelike. The North American members of the genus have been discussed by the writer.[5]

The genus *Balantium* Kaulf., was proposed in 1824,[6] with two species: *B. auricomum* Kaulf. (p. 228) and *B. culcita* (L'Hérit.) Kaulf. (p. 229). Kaulfuss' redescription of *B. culcita* is only two lines long and omits all mention of the sori; but of *B. auricomum* there is a long and detailed description (agreeing very closely with the generic diagnosis) and a figure, which indicate clearly the importance of this species in the describer's mind and seem to justify the acceptance of this, rather than *B. culcita*, as the generic type. There is every reason to suppose that the material of *B. auricomum* supplied the major data for his generic description. *Balantium*, thus typified by *B. auricomum* (= *arborescens*), becomes a synonym of *Dicksonia*, founded on the same species. Since in recent years *Balantium* has been tacitly regarded as typified by *B. culcita*, the genus *Balantium* of authors must receive another name. Fortunately, *Culcita* is available.

The genus *Culcita* Presl dates from 1836,[7] and is founded on a single species, *Culcita macrocarpa* Presl, a change of name for *Dicksonia culcita* L'Hérit. and *Balantium culcita* Kaulf. It is thus exactly the equivalent of the genus *Balantium* of recent writers.[8]

The species of *Culcita* are as follows:

1. **Culcita macrocarpa** Presl, Tent. Pter. 135. *pl. 5, f. 5.* 1836.
   Dicksonia culcita L'Hérit. Sert. Angl. 31. 1788.
   Balantium culcita Kaulf. Enum. Fil. 229. 1824.

[4] Berl. Jahrb. Pharm. **21:** 53. 1820.

[5] Contr. U. S. Nat. Herb. **16:** 54–58. *pl. 30–32.* 1912.

[6] Enum. Fil. 228. 1824.

[7] Tent. Pter. 135. *pl. 5, f. 5.* 1836.

[8] It is interesting to note that Presl applies the name *Balantium* in the sense of *Dicksonia* with the exception of a single species, and further that he takes up the name *Dicksonia* for the genus of Polypodiaceae that we now call *Dennstedtia*, omitting therefrom both of the species originally described under *Dicksonia* by L'Héritier!

The generic type; known from Madeira, Teneriffe, and several of the Azores; originally described from San Miguel. The very large sori at once distinguish this species, of which the following specimens are at hand:

MADEIRA: San Vicente, June 21, 1850, *Lowe* 31. Without special locality *Mandon* 300; *Mason* in 1857.

AZORES: San Miguel, *Trelease* 1143. Pico, *C. S. Brown* 317.

2. **Culcita coniifolia** (Hook.) Maxon, Report Smiths. Inst. **1911:** 488.

pl. 13, f. c. 1912.

Dicksonia coniifolia Hook. Sp. Fil. **1:** 70. *pl. 24. A.* 1844.
Dicksonia martiana Klotzsch; Hook. Sp. Fil. **1:** 70. *pl. 24. B.* 1844.
Balantium martianum Fée, Vasc. Crypt. Brés. **1:** 155. 1869.
Culcita schlimensis Fée, Mém. Foug. **10:** 47. *pl. 36, f. 3.* 1865.
Balantium coniifolium J. Sm. Hist. Fil. 258. 1875.

Variable in several characters, but perhaps no more so than to be expected in a plant occupying so wide an area. Its nearest ally is *C. macrocarpa.* Hooker's type was from Caracas (*Linden* 538). The following specimens are in the National Herbarium:

JAMAICA: John Crow Peak, alt. 1,650 to 1,800 meters, *Harris* 7336; *Underwood* 3258; *Maxon* 1333, 1333a; Blue Mountains, alt. 1,800 meters, *Hart* 132.

CUBA: Near summit of Pico Turquino, Sierra Maestra, *Léon* 11155.

COSTA RICA: San Cristóbal, *Werckle.* San Jerónimo, alt. 1,500 meters, *Werckle* (Jiménez, no. 578). Without locality, *Brade* 142.

PANAMA: Humid forest between Alto de las Palmas and top of Cerro de la Horqueta, Chiriquí, alt. 2,100 to 2,268 meters, *Maxon* 5459, 5459a. Cordillera above "Camp I," Holcomb's Trail, 10 miles above El Boquete, Chiriquí, alt. 2,100 to 2,150 meters, *Killip* 5326, 5328.

COLOMBIA: Medellín, *Bro. Henri-Stanislas* 1714. Murillo, Tolima, alt. 2,100 to 2,500 meters, *Pennell* 3181. Camino de Gachetá, *Bro. Ariste-Joseph* A483. Guasca, *Bro. Ariste-Joseph* A217. Without locality, *Bro. Ariste-Joseph* 198; *Triana* 179.

BRAZIL: Serra do Itatiaya, *Dusén* 170; same locality, alt. 2,000 meters, *Rose & Russell* 20490.

Reported also from Hispaniola, Mexico, and Ecuador.

3. **Culcita javanica** (Blume) Maxon.

Dicksonia javanica Blume, Enum. Pl. Jav. 240. 1828.
Dennstedtia javanica Christ, Bull. Herb. Boiss. II. **4:** 617. 1904.
Balantium javanicum Copel. Phil. Journ. Sci. Bot. **4:** 62. 1909.

Described from Java and attributed only to that island. Not seen by the writer. Listed by Christensen as valid, and so regarded by recent writers.

4. **Culcita formosae** (Christ) Maxon.

Dennstedtia formosae Christ, Bull. Herb. Boiss. II. **4:** 617. 1904.
Balantium formosanum Christ, Geogr. Farne 155. 1910.

Founded upon specimens collected on Formosa by Faurie (no. 676). Said to be a close ally of *C. javanica,* but listed by Christensen as valid. No material has been seen.

5. **Culcita copelandi** (Christ) Maxon.

Dicksonia copelandi Christ, Phil. Journ. Sci. Bot. **2**: 183. 1907.
Balantium copelandi Christ; Copeland, Phil. Journ. Sci. Bot. **3**: 301. 1908; **4**: 62. *pl. 19*. 1909.

A very distinct species, separated by Christ from *C. straminea;* apparently confined to the Philippines. The true indusium is somewhat membranous, erose-dentate, and provided with occasional cilia. In these respects and in its pronounced hairy covering the plant shows less alliance with *C. straminea* than with *C. dubia* and the new species here described as *C. blepharodes*. The following specimens are in the National Herbarium:

LUZON: Vicinity of Baguio, Province of Benguet, *Elmer* 6025 (co-type), 9000; *Topping* 196, 241; *Bartsch* 241; *Loher* 1304. Province of Abra, *Ramos* 7158. Mount Tonglon, *Loher* 965.
NEGROS: Dumaguete (Cuernos Mountains), Province of Negros Oriental, *Elmer* 9694, 9899, 10394.

6. **Culcita straminea** (Labill.) Maxon.

Dicksonia straminea Labill. Sert. Austr. Cal. 7. *pl. 10*. 1824.
Dicksonia torreyana Brack. in Wilkes, U. S. Expl. Exped. **16**: 278. *pl. 38, f. 2*. 1854.
Dennstedtia straminea J. Sm. Hist. Fil. 265. 1875.
Balantium stramineum Diels in Engl. & Prantl, Pflanzenfam. 1^4: 119. 1899.
Not *Sitolobium stramineum* Brack. 1854.

Described and figured by La Billardière on specimens from New Caledonia; attributed by Christensen to Polynesia generally. The following specimens are at hand.:

NEW CALEDONIA: Koghis, alt. 250 meters, *Franc* 477. Yahoué, alt. 250 meters, *Franc* (*Rosenstock*, no. 63).
FIJI ISLANDS: Sandalwood Bay, *Wilkes Exped.* (type of *Dicksonia torreyana* Brack., 3 sheets). Without special locality, *Prince* in 1898.
SAMOAN ISLANDS: Savaii, *Reinecke* 143a (2 sheets, both labeled "*Davallia moluccana* Bl. var. *amboynensis* Hook."). Upolu, *Betsche* 119 (as *Dicksonia dubia* Gaud.); *Reinecke* 97 (2 sheets, both labeled "*Davallia moluccana* Bl., normale Form."); *Reinecke* 190 (labeled "*Davallia dubia* R. Br."). Tutuila, just below top of Matefao, *Setchell* 389. Island not indicated, *Powell* 117 (as *Dicksonia straminea*).

These plants agree well among themselves and represent a single species that must be regarded as referable to *Culcita*, notwithstanding their arborescent habit; the trunk is described by Brackenridge as "8 to 10 feet high, its surface rough, owing to the base of the old stipes remaining attached to it," in this character resembling *Dicksonia*.

The sori, though very small in comparison with those of *C. macrocarpa* and *C. coniifolia*, are similar in structure; the receptacle is elongate transversely; the outer valve of the "indusium" is formed of a slightly modified, but deeply saccate, recurved lobule of the leaf margin, with pale thin borders; the inner lip, or true indusium, is similar in form to the outer, being vaulted,

ample, subcoriaceous, and subentire, and closes against it, as if hinged on the transverse receptacle.

In these particulars the resemblance of *Culcita straminea* to the Australian plant described as *Davallia dubia* R. Br. is slight, yet the two have been greatly confused. The original description of *Davallia dubia* reads as follows: "Frondibus supradecompositis, foliolis 2-3-pinnatis pubescentibus, pinnulis linearilanceolatis incisis, involucris subrotundis fimbriatis subaxillaribus lobulo saepe reflexo semitectis. (J. D.) *v. v.*" The specimens were from Port Jackson (New South Wales) and Tasmania. The numerous Australian specimens at hand (cited hereafter) agree perfectly with Brown's description in having the marginal lobule opposite to the sorus often reflexed and sometimes partially protecting the sori; but the sorus is relatively distant from the margin, the marginal lobule is not at all modified and is never saccate, and the true indusium is membranous and conspicuously dentate-ciliate, is early thrust back against the leaf surface, and in form, structure, texture, and position is so unlike the marginal lobule that it can hardly be regarded as forming any part of a "double" indusium. In these respects *C. dubia* differs so definitely from *Culcita* proper that it ought at least to be regarded as the type of a new subgenus. The details of structure are shown fairly well in Hooker's plate 24, figure C.[9]

The Fiji plant listed by Brackenridge in 1854 as *Sitolobium stramineum* is not *Culcita straminea*, but a new species very closely allied to the *Davallia dubia* of Robert Brown. It is described below.

Not all of the Reinecke plants from Samoa distributed as *Davallia moluccana* Blume or one of its varieties pertain to *C. straminea*. The following numbers, as represented in the National Herbarium, belong to *Saccoloma moluccanum* (Blume) Mett., regarding that species in its usual widely collective sense: *Reinecke* 71 and 97a, 4 sheets, from Upolu; *Reinecke* 143, from Savaii.

7. Culcita dubia (R. Br.) Maxon.

Davallia dubia R. Br. Prodr. Fl. Nov. Holl. 157. 1810.
Dicksonia dubia Gaud. in Freyc. Voy. Bot. 367. 1827.
? Balantium brownianum Presl, Tent. Pter. 134. *pl. 5, f. 4.* 1836.
Sitolobium dubium Brack. in Wilkes, U. S. Expl. Exped. **16:** 273. 1854.

As noted under the last preceding species *Davallia dubia* was founded on material from New South Wales and Tasmania. Luerssen[10] cites four collections from the Fiji group as *Dicksonia dubia*, but they doubtless pertain to the next species, *C. blepharodes*. As represented in the National Herbarium *C. dubia* is confined to Australia, the specimens being as follows:

AUSTRALIA: Vicinity of Sidney, New South Wales, *Wright; Dāmel* (ex herb. Bot. Mus. Hamburg); *Wilkes Exped.* (2 sheets, as *Sitolobium dubium*).

[9] Sp. Fil., vol. 1, 1844, as *Dicksonia dubia* (R. Br.) Gaud.

[10] Fil. Graeff. 233. 1871.

"Eastern coast," *Verreaux* 135 (as *Dicksonia davallioides*). Without special locality, *Verreaux* 290 (2 sheets, as *Davallia dubia*). Gippsland, Victoria, *F. von Müller*. Without special locality, *Schomburgk*.

The sorus characters of this species and of *C. straminea* have been discussed under the latter species. Since *C. blepharodes* is somewhat intermediate in sorus structure, *C. dubia* may best be regarded as the type merely of a new subgenus, **Calochlaena,** the name being chosen in allusion to the distinctive character of the delicate true indusium.

A good deal of doubt exists as to the proper reference of *Balantium brownianum*. This name was proposed in 1836 by Presl, who cited as synonyms *Davallia dubia* R. Br. and *Dicksonia fallax* Kaulf., and published an illustration (*pl. 5, f. 4*). The name *Davallia fallax* had been given by Kaulfuss to an Australian plant distributed by Sieber. Luerssen, who has examined this, refers it to *Dicksonia dubia;* but the highly conventional figure shows sori like those of *C. straminea*, as Hooker has remarked, and bearing very little likeness to those of *C. dubia*, whether or not it was drawn from Australian material. Brackenridge has pointed out the same discrepancy, and until the Sieber plant has been re-examined critically the correct disposition of *Balantium brownianum* must remain doubtful.

8. **Culcita blepharodes** Maxon, sp. nov.

Frond (incomplete) 1 meter long or more, the stipe about one-third as long as the blade, sulcate, ochraceous from a darker base; blade tripinnate, the pinnae subopposite, ascending, about 30 cm. long, 5 to 8 cm. broad, narrowly deltoid-oblong, the rachis firm, brownish-stramineous; pinnules distant, alternate to subopposite, oblique, deltoid-oblong, acuminate; segments 10 to 15 pairs, slightly oblique, linear or linear-oblong, cuneate at the inequilateral base, abruptly acuminate, distant, faintly connected along the ventral groove of the tertiary rachis, deeply lobed throughout; lobes of the larger segments 5 to 7 pairs, mostly with 2 lobules or crenations on the distal side, the apical one sterile and curved upward, the other broader and soriferous; sorus about 1 mm. in diameter; fertile lobule invariably concave, but not saccate; true indusium ample, delicately membranous, long-ciliate, born upon a narrowly oblong, transverse receptacle, early thrust backward against the leaf surface and exposing the numerous sporangia; paraphyses many, slender, brown; under surface of blade freely villous-hirsute, the hairs extending abundantly to the veins; upper surface slightly hirsute, glabrescent.

Type in the U. S. National Herbarium, no. 1,094,080, collected at "Lomo-Lomo" or "Somu-Somu," Fiji Islands, by the Wilkes Expedition (1838–42). There is a second, smaller specimen of the same collection.

This is the plant which Brackenridge, having mistakenly redescribed the *Dicksonia straminea* of La Billardière as a new species of *Dicksonia* (*D. torreyana* Brack.), listed as *Sitolobium stramineum*. He properly compares it with *Sitolobium dubium* Brack. (*Culcita dubia*) and notes several points of distinction.

Culcita blepharodes belongs to the subgenus *Calochlaena*, and is closely

allied only to *C. dubia*. From that it differs in having the receptacle nearer the margin, the marginal lobule regularly though not deeply concave (not recurved or reflexed, as in *C. dubia*) and approaching somewhat the "accessory indusium" form of typical *Culcita*, and the true indusium larger and more freely long-ciliate. The specimen selected as the type is very incomplete, and the measurements are thus not dependable. As noted previously this is doubtless the plant listed by Luerssen as *Dicksonia dubia* on Fiji specimens collected by Graeffe (nos. 151, 490) and *Dämel* (nos. 31, 32).

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

PHILOSOPHICAL SOCIETY OF WASHINGTON

867TH MEETING

The 867th meeting was held in the Cosmos Club auditorium Saturday, May 20, 1922, with President CRITTENDEN in the chair and 42 persons present.

R. C. TOLMAN: *Some remarks on the Quantum Theory.* This paper was illustrated by charts and figures, and was discussed by Messrs. BEAL, C. A. BRIGGS, FAIRCHILD, FOOTE, HAWKESWORTH, MOHLER, PAWLING, SOSMAN, TUCKERMAN, WELLS and WHITE. This paper has been published in full in 1922, number of the Journal of the Optical Society.

The speaker first reviewed the steps by which the Classical Dynamics was led to expect that there would be an equipartition of energy between the different modes of vibration in the hohlraum. The modifications in the Classical Dynamics which are proposed by Quantum Theory to meet the contradiction between this prediction of the Classical Dynamics and the experimental facts were then discussed.

The equations given by Quantum Theory for the possible steady motions of simple oscillators and rotators and for the distribution of elements at thermodynamic equilibrium were then developed. It was shown how these equations account for the photoelectric effect, the inverse photoelectric effect, the relation between the frequenceis of absorbed and phosphorescent light, the energy distribution in the hohlraum, the Debye theory of the specific heat of solids, the theory of rotational specific heat of gases, the theory of the rotational spectra of gases, and the theory of the emission spectra of the elements.

The Quantum Theory was then criticised from the point of view of its arbitrariness, its conflict with the facts concerning the undulatory nature of light, its apparently unnecessary abandonment of the Classical Dynamics in solving the problem of the distribution of energy in the hohlraum and the unsatisfactoriness of its atomic model. A model which contains some features which it might be desirable to incorporate in the final model of the hydrogen atom was then exhibited.

W. R. GREGG, *Recording Secretary, Pro Tem.*

869TH MEETING

The 869th meeting was held in the Cosmos Club auditorium Saturday, October 7, 1922.

By invitation Mr. RAYMOND DAVIS presented a paper on "deciphering of charred paper records" which was illustrated by lantern slides. After the presentation of the paper the author answered numerous questions by Messrs. WHITE, CRITTENDEN, HEYL, and others.

Author's Abstract: The bureau of Standards was recently called upon to find a method for deciphering the written and printed matter contained on charred paper.

The charred papers submitted apparently had been subjected to heat in a closed vessel, such as a safe,—the paper having been converted into black sheets of carbon and not to ashes as would have been the case had they been burned in an open container.

With casual observation no traces of writing are visible, but under certain critical conditions of lighting very faint traces of markings can be seen. These traces are not sufficiently clear to permit deciphering.

In some preliminary trials made on paper charred for the purpose, conversion of the iron salts contained in the ink into colored salts was tried. These were unsuccessful.

It is known that the photographic plate, besides being sensitive to light, is also sensitive to certain gases and vapors. Some of these have the property of fogging or rendering developable such portions of the plate as are exposed to their actions. Certain other gases or vapors have the contrary property, that is, they partially or completely desensitize the plate.

For the first trial a sheet of the carbonized paper was placed between the two "fast" photographic plates and kept in the dark for two weeks. On development in the usual manner a very perfect copy of both the writing and the printing was obtained. It appears that the carbonized paper contains gases that fog the photographic plate. Where the ink is present, little or no effect takes place. Apparently the ink acts as a screen, hindering the escape of the gas.

It is interesting to note that the writing on both sides of the charred paper appears, that from the back being fainter than that from the face. Apparently the ink penetrates the paper sufficiently so that its residue reduces the amount of gas escaping from beneath.

No attempt was made to determine the nature of the active material contained in the charred paper. It is quite likely that it contains products similar to those obtained by the destructive distillation of wood.

Further tests showed that photographic plates of sensitiveness usually termed fast or medium are best adapted for this purpose. However, the sensitiveness to light is no definite indication of the sensitiveness to the charred paper. For example Seed 30 and Seed 26 X are of equal sensitiveness to the charred paper, the former is considerably faster to light than the latter. Very good copies can be obtained with either of these plates after a weeks time in contact with charred paper. Very slow plates such as "*Process*" are not suitable as exposure of 32 days shows only faint action. Photographic printing and enlarging papers are very insensitive to the charred paper.

Results obtained by the use of photographic films were very surprising, as shown by the two types of emulsions selected for the test, namely: Eastman "*Portrait Film*" and Eastman "*Super Speed Portrait Film.*"

The Portrait Film showed no effect in 32 days. The Super Speed Portrait showed very slight but interesting effect with a 16 day exposure and only a little better at 32 days. This was just the reverse of that with the plates,

the inked areas showing black on the films, whereas on the plates they showed clear. That is, with the films the ink is the active portion, the charred paper producing no fogging. It is also noted that the chemical fog of development is much lighter over the portions of the film covered by the charred paper as compared with the uncovered areas.

The results suggest that there are perhaps two different kinds of gases given off, one kind by the charred paper and another by the ink, both of which fog the photographic emulsion, but the one from the charred paper more rapidly.

It was found that a short washing of these films in distilled water, about five minutes, followed by thorough drying, gave results similar to those obtained with plates. Very good copies were obtained from washed film after 8 days contact with the charred paper.

Mr. R. W. G. WYCKOFF presented a paper entitled "Crystal structure of ammonium chloride and hydrazine hydrochloride," which was illustrated by diagrams. It was discussed by Messrs. HAWKSWORTH, TUCKERMAN, CRITTENDEN, and BROWN.

Author's Abstract: *The crystal structure of hydrazine dihydrochloride.* Using Laue photographic and spectrographic data and making use of the results of theory of space groups, the manner of arrangement of the atoms within the unit cube of a crystal of hydrazine hydrochloride, which contains four chemical molecules and is 7.89 A.U. on a side, has been determined. The corresponding space-group is T_h^6. The parameter v defining the positions of the chlorine atoms is found as 0.27+ and the most probable value of the nitrogen parameter is estimated as about 0.04. The distance between adjacent chlorine atoms thus is approximately 3.69 A.U.; between chlorine and nitrogen atoms about 3.14 A.U. It is pointed out that these results are markedly at variance with the hypothesis of constant atomic radii.

On the crystal structure of ammonium chloride.—It is shown that the Laue photographic data obtained from crystals of the low temperature form of ammonium chloride are in agreement with the powder data in assigning to it a structure containing one chemical molecule within the unit cube. The disagreement between the symmetry of the arrangement of the atoms of ammonium chloride and its described crystallographic symmetry is thus completely established. As a result it is pointed out that unless these crystallographic data are shown to be erroneous it will not be permissible to accept etch figure data and face development as definite indications of the symmetry of the arrangement of the atoms within a crystal.

Mr. W. W. COBLENTZ read a paper on "*Further measurements of stellar temperatures and planetary radiation,*" which was illustrated by lantern slides. It was discussed by Messrs. WHITE, PAWLING, and ABBOT.

Author's Abstract: During the past summer, through the generosity of the Lowell Observatory, Flagstaff, Arizona, who financed this research, a further opportunity was presented to continue the measurements of 1921 relating stellar temperatures and pianetary radiation. Especial acknowledgement is due Dr. C. O. Lampland for kindly operating the telescope.

The speaker reported a verification of the estimate presented before this Society (The meeting of December 17, 1921) of the temperatures of 16 stars as determined from their spectral energy distribution which was obtained by means of a new spectral radiometer, consisting of a series of transmission screens and a vacuum thermocouple.

By means of these screens, which, either singly or in combination, had a uniformly high transmission over a fairly narrow region of the spectrum and terminating abruptly to complete opacity in the rest of the spectrum, it was possible to obtain for the first time the radiation intensity in the complete stellar spectrum as transmitted by our atmosphere.

The recent measurements of the spectrol radiation components, made principally on the sun, the temperature of which was used as a standard of comparison, verify the previous measurements of stellar temperatures, which range from 3000° K for red, class-M stars, to 12000° K for blue, class-B stars.

Planetary radiation.—The thermal radiation emitted from a planet as a result of warming by exposure to solar radiation, including heat which may be radiated by virtue of a possible high internal temperature of the planet itself, is essentially of long wave lengths 7μ to 12μ. Hence, by means of a 1 cm. cell of water, interposed in the path of total radiation emanating from the planet, this long wave-length radiation can be separated from the reflected solar radiation, and in this manner a measurement obtained of the energy reradiated. If there is planetary radiation then the water cell transmission will be less than that of direct solar radiation.

It was observed that the water cell transmission of the total radiation emanating from Jupiter is practically the same as that of the direct solar radiation. From this it appears that the outer atmosphere of Jupiter does not radiate appreciable long wave length infra-red energy as the result of warming by solar rays, and that the atmosphere is sufficiently thick and opaque to trap all the energy reradiated as the result of warming of its interior by solar radiation, or by internal heating, if the interior of Jupiter is still highly heated.

The radiometric measurements of Venus, Jupiter, and Saturn are in good agreement with similar measurements made at Mt. Hamilton, Calif., in 1914, showing a decidedly lower transmission of radiation through the water cell in the case of Venus and Saturn.

The intensity of the planetary radiation increases with decrease in the density of the surrounding atmosphere and (as interpreted from the water cell transmissions) in per cent of the total radiation emitted is as follows: Jupiter (0), Venus (5), Saturn (15), Mars (30), and the Moon (80).

The water cell transmission of the radiations from the Southern (50.6%) and northern (53.1%) hemispheres of Mars should be and are higher (*i.e.*, the planetary radiation is lower) than that of the radiations emanating from the equatorial (47.3%) region, owing to the depletion of the reradiated energy by the greater air mass. Moreover, the intensity of the planetary radiation from the northern hemisphere of Mars was found to be less than from the southern hemisphere. This is to be expected in view of the observed cloudiness over the northern hemisphere which is approaching the winter season and hence is at a lower superficial temperature.

The radiometric measurements of Mars are of especial interest in view of the question of the temperature of this planet.

The calculations of Lowell, based on the heat retained, give a mean temperature of 9° C. for the surface; while another calculation gives a temperature of 22° C. He points out that owing to cloudiness, only 60 per cent of the incident solar radiation is effective in warming the earth, while 99 per cent is effective in warming the surface of Mars.

In a recent discussion of climatic conditions on Mars, inferred from phenomena generally observed on the planet, Pickering estimates the mean annual temperature at 20° F. as compared with the mean annual temperature of the earth at 59° F. (15° C.). At night the Martian temperature is below 32° F. (0° C.) and at noon it is perhaps 60° to 70° F. (15° to 20° C.). These estimates are arrived at from the appearance and disappearance of snow and frost during the course of the Martian day, and from the fact that snow is never seen on the equator at Martian noon.

The radiometric measurements are in agreement with the calculation of Lowell and with the arguments recently set forth by Pickering, showing a considerable rise in temperature of the surface of Mars.

Probably the most convincing experimental observations of the range of temperature of the moon are those of Langley and Very, and later, those of Very. These measurements indicate inferred effective lunar temperatures ranging from 45° C. to over 100° C. The calculated value using recent data on the solar constant, indicates a lunar temperature of 82° C. When we consider that 30 per cent of the total radiation emanating from Mars is of planetary origin, as compared with 80% from the moon, and that all the evidence shows that the lunar surface becomes appreciably warmed, it appears that there is also a considerable temperature rise (10° to 25° C.) on the surface of Mars as calculated by Lowell. So whether or not we accept the view that vegetation can exist on Mars, the radiometric measurements confirm other meteorological data, showing that at Martian noon the snow is melted which could not happen if the temperature were —39° C., as some have calculated.

As for the views held by some of the possibility of vegetation growing on Mars, much depends upon whether we think of palm trees growing in our tropics, or the mosses and lichens which thrive on the apparently bare piles of volcanic cinders of Arizona and under our Arctic snows.

H. H. KIMBALL, *Recording Secretary*

ENTOMOLOGICAL SOCIETY

349TH MEETING

The 349th meeting of the Society was held May 4, 1922 in Room 43 of the New National Museum, with President GAHAN in the chair and 36 persons present.

Mr. GAHAN spoke briefly about the new Brazilian Entomological Society. The first paper of the evening was *The operation of the Federal Insecticide Act*, by Dr. J. K. HAYWOOD. It was discussed by Dr. MCINDOO.

Messrs. HAYWOOD and MIDDLETON spoke of tree doctors injecting trees with fluids to kill insects.

Notes.—MR. BRIDWELL announced the discovery of a *Bruchophagus*, indistinguishable from *B. funebris*, from seeds of *Oxytropis lamberti* collected by L. WELD in Colorado. This is apparently the first record of this species breeding in legumes other than clover and alfalfa.

Dr. ALDRICH stated that Dr. C. H. T. TOWNSEND had completed his book on the muscoid flies. It has been sent to the United States for publication.

J. A. HYSLOP spoke as follows: "I have received a most interesting communication from Mr. C. W. CREEL, State Entomologist of Nevada, accompanying a vial containing a large number of Chrysomelid beetles. Mr Creel stated that the County Agent of Clark County sent in these specimens,

which were unknown to him, with a statement that they were doing very serious damage to all the vineyards in the Las Vegas Valley in southern Nevada. This is a desert region where they are growing Muscat grapes under irrigation. The beetles prove to be *Glyptoscelis squamulata* Crotch, a species which has been collected in southern California and Arizona on sage brush and the small desert sunflower *Balsamorhiza sagittata*.

"It is evidently a native desert insect which has turned its attention to the cultivated plant which has usurped its territory. The County Agent went on to say that the insects do their work at night, boring small holes into the buds just before the vines started to leaf out, and eating out the center of the bud."

350TH MEETING

The 350th meeting was held June 1, 1922, in Room 43 of the New National Museum, with President GAHAN in the chair and 57 members and guests present.

The first paper of the evening was an account by Dr. WM. M. MANN of his recent trip to South America on the Mulford Exploration, illustrated with lantern slides.

The balance of the evening was devoted to notes and exhibition of specimens.

Dr. MCINDOO asked where the silk was obtained which was used in the ants' nests. Dr. MANN said it was obtained from the larvae.

Mr. HYSLOP spoke of a nitidulid attacking strawberries in New York and Connecticut. He stated that about three years ago specimens of a small nitidulid were sent to the National Museum from Youngstown, N. Y., for determination. These proved to be the European *Heterostomus pulicarius* L., a species apparently of but little economic importance in Europe, where it is recorded as feeding on the pollen of Linaria. In 1920 Mr. H. NOTMAN described what Mr. SCHWARZ considers as this species under the name of *H. mordelloides*, from Schoharie, New York. In 1921, Mr. H. MORRISON collected specimens of this same beetle in Arnold Arboretum at Boston. In this number of the Bulletin is a report by Dr. E. P. FELT that this insect is seriously damaging strawberries in Columbia County, and is distributed over Saratoga, Albany, Niagara, and Schoharie Counties, New York. The damage is done by the adult beetles feeding at the base of young blossoms and producing "nubbins" or entirely destroying the fruit.

One of the most interesting developments of the month has been the determination as *Anomala orientalis* Water, of a beetle collected in Connecticut during the past two years. This is the *Anomala* which occasioned so much concern in Hawaii about ten years ago. The insect is a native of Japan and was probably introduced into Hawaii before 1908 in soil on the roots of imported plants from Japan. In 1908, Dr. LYON, then working with the Hawaiian Sugar Planters Association observed large numbers of these larvae at the base of cane plants but mistook them for the Japanese beetle of Hawaii (*Adoretus tenuimaculatus* Water.). In 1912, Dr. A. SPEAR, in studying the fungous diseases of insects affecting sugar-cane in Hawaii collected a number of these larvae and turned them over to Mr. F. MUIR, who recognized them as a species new to the Island. In June of that year Mr. Muir visited the infested fields and collected adults; the pest though infecting but a small area was extremely destructive, and the Hawaiian Sugar Planters Association

detailed a specialist to proceed to the Orient and obtain parasites for the control of this pest. This work was so successful that one of the parasites (*Scolia manilae* Ashm.) was established between the years of 1914–16 and by 1919 had so thoroughly controlled this pest that from an area where in 1917, 3,500 *Anomala* grubs were collected in 1919 only four grubs were found by most diligent searching. The parasite has extended its range beyond the area infested by the *Anomala* and is now infesting the Japanese beetle of Hawaii. That the *Anomala* is established in Connecticut seems evident as specimens have been collected in the same nursery two successive years.

Dr. BAKER discussed a species of aphid in Baltic Amber.

Dr. ALDRICH made some remarks on *Lucilia* species. He reported *Onesia agilis* Meigen, a European genus new to the country. It is a scavenger and has been reared several times by Mr. THEODORE H. FRISON at the Japanese Beetle Laboratory.

Mr. ROHWER exhibited the nest of *Pseudomasaris vespoides* (Cresson) which had recently been received from Mr. L. H. WELD. The nest was composed of five cells, four of which produced the vespid and one a chrysidid parasite belonging to the section *Gonochrysis*. The nest of this wasp was first observed by DAVIDSON and more recently by Professor COCKERELL. This is the first complete nest in the National collection of this kind.

Mr. ROHWER exhibited the resin and pebble nest of one of the bees belonging to the genus *Dianthidium*. This nest was attached to an oak twig and was recently collected by Mr. L. H. WELD in California. It resembles closely the nest of *D. arizonicum* Rohwer, recently illustrated by Mr. MIDDLETON, but was so heavily parasitized by a chalcid of the genus *Monodontomerus* that none of the bees had emerged.

Mr. BUSCK read the following paragraph from the report of the Swedish botanist Pehr Kalm, a student of Linnaeus, who made what was probably one of the first scientific expeditions to North America, in the middle of the eighteenth century.

"I came unconsciously near bringing a great misfortune upon Europe. At my departure from America I brought with me a small package of sweet peas that looked very good and sound. On August 1, 1751, some time after I had arrived in Stockholm, I opened the package and found all the peas worm-eaten. From the hole in each pea an insect was peeking out, and some crawled into the open intending to try the new climate. I was glad to close the package again instantaneously and thus prevent the escape of these destructive creatures; and I must confess that when I first opened the package and saw those insects I was more frightened than if I had found a poisonous snake in it, for I knew what damage might have been wrought in my fatherland if but two or three of them had escaped. Many coming generations in many places would then have had reason to pass condemnation on me for causing so much misfortune."

Mr. ROHWER in discussing Mr. Busck's remark pointed out that with all the precaution of the early naturalists they had not been successful in keeping American insects out of Europe and gave as an example the Douglas fir seed chalcid *Megastigmus spermotrophus* Wachtl, a species which was first described from the material secured in Denmark from American seeds. This seed chalcid is a much greater pest in Europe than it is in America.

Mr. GAHAN gave the following note on the distribution of the clover chalcid, *Bruchophagus funebris* (How.): *America*, in clover, alfalfa and astragalus;

Chile, in wild alfalfa; *Omsk*, *Siberia*, in alfalfa seed; *Manchuria*, in seeds of Trifolium; *Cape Town*, South Africa, from seeds of lucerne or alfalfa.

J. C. BRIDWELL announced the recovery of *Kytorhinus karasini* Fischer v. Waldheim (1808), type of the genus *Kytorhinus* Fischer, which has not been recognized since its description. It was originally described from the seeds of *Robinia* (now *Caragana*) *jubata* from the Altai Mts. in Central Asia. The genus *Kytorhinus* has been represented by species in the Mediterranean region, the Caucasus, Central Asia, and a species was described by Dr. Sharp as the type of his genus *Pygobruchus*. The material in question was found by the inspectors of the Federal Horticultural Board in seeds of a species of *Caragana* (possibly *jubata*) which occurs in Szechuen Province, China, from which the material was sent to the Foreign Seed and Plant Introduction Office of the Bureau of Plant Industry, and there are in the U. S. National Museum a new species of the genus from India and one from China received in this manner. A Canadian species of the genus has been recently discovered in material collected by Mr. F. C. CARR at Edmonton, Alberta. This is the first authentic instance of a mylabrid genus (in the narrower sense) common to the old and new worlds. Descriptions of the new species have been prepared for publication.

Dr. SCHWARZ said that species collected in South America many years ago by DARWIN are now only partly named. Dr. SCHWARZ also stated that the first scientific expedition in South America was made by the French engineer CONDERMAINE about 1770. His main object was to measure the equator. He went from Ecuador to the Rio Napo River. The second scientific expedition was by HUMBOLDT and BONPLAND. They went down the Orinoco to Ecuador mainly to investigate the high volcanoes.

CHAS. T. GREENE, *Recording Secretary*

SCIENTIFIC NOTES AND NEWS

Closer cooperation between the weather observation stations in the Bahamas and the Weather Bureau of the United States Department of Agriculture is being established in connection with the hurricane-warning work. Mr. BENJAMIN C. KADEL, a meteorologist from the U. S. Weather Bureau, has been sent to Nassau and to Inaugua, in the Bahamas, to assist in this work.

Excavations for a new hotel building at Connecticut Avenue and De Sales Street in Washington have uncovered the stumps and residues of a Tertiary forest of cypress of considerable geological interest.

ERNST G. FISHER, chief mechanical engineer in the U. S. Coast and Geodetic Survey, retired from the service August 5, 1922, after over thirty-five years of active work for the Government.

JOSEPH W. GRIEG, recently assistant in the department of mineralogy at Columbia University, has been added to the staff of the Geophysical Laboratory, Carnegie Institution of Washington, as a petrologist.

JOHN B. HENDERSON, a Regent of the Smithsonian Institution, has purchased for the Division of Mollusks the General Evezard Collection of mollusks estimated at from 7,000 to 10,000 specimens, including a large number of types. General Evezard lived in western India for twenty-eight years, and being interested chiefly in mollusks made large collections of those animals.

Professor A. S. HITCHCOCK, Custodian of Grasses at the National Museum, is giving a course on taxonomic botany in the graduate School for Department Workers, U. S. Department of Agriculture.

ELLSWORTH P. KILLIP, Aid in the Division of Plants, U. S. National Museum, returned in October from a botanical collecting trip of six months in Colombia organized by the New York Botanical Garden, the Gray Herbarium, the Philadelphia Academy of Natural Sciences, and the National Museum.

Dr. AUGUST KROGH, oceanographer, Copenhagen, Denmark, winner of the Nobel Prize in medicine, 1920, is visiting in Washington, and lectured before the Entomological Society November 8.

C. P. LOUNSBURY, entomologist of the Union of South Africa, who has been in official entomological work for twenty-six years at Cape Town, is visiting the United States and has recently been at the National Museum and Department of Agriculture. Mr. Lounsbury is a New Englander by birth and a graduate of the Massachusetts Agricultural College.

W. W. RUBEY, assistant geologist of the U. S. Geological Survey, has been granted leave of absence to accept an instructorship at Yale University for the current year.

Dr. GEORGE OTIS SMITH has resigned as director of the U. S. Geological Survey in order to qualify as a member of the Coal Commission appointed by the President. Dr. PHILIP S. SMITH has been appointed acting director in the interim.

DAVID WHITE, who completes ten years' service as chief geologist in the U. S. Geological Survey on November 16, will be relieved of that duty at his own request and W. C. MENDENHALL, for more than ten years the geologist in charge of the Land Classification Board, will be made chief geologist. Mr. Mendenhall will be succeeded as chief of the Land Classification Board by HERMAN STABLER.

ANTIQUARIAN